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retractable Conveyor

PATENT SPECIFICATION (11) 1 576 718

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(19)

(54) IMPROVEMENTS IN AND RELATING TO CONVEYOR HANDLING SYSTEMS

(71) We, METAL BOX LIMITED, a British Company, of Queens House, Forbury Road, Reading RG1 3JH, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement: —

The present invention relates to conveyor handling systems.

According to the invention, there is provided a conveyor handling system for batching regularly arriving articles or article collations into groups and intermittently discharging the groups, comprising an infeed conveyor for carrying regularly spaced articles or collations, a retractable conveyor for receiving the regularly spaced articles or collations from the infeed conveyor and discharging them onto an intermittently drivable transfer conveyor, and a control system operable to extend the downsteam end of the retractable conveyor at a speed at least equal to the surface speed of the retractable conveyor, to allow the transfer conveyor to be independently driven to discharge articles therefrom, thereafter causing the transfer conveyor to be driven at the same speed as the surface speed of the retractable conveyor while retracting the downstream end of the retractable conveyor to cause the transfer of articles from the retractable conveyor to the transfer conveyor.

A conveyor handling system embodying the invention for positioning regularly arriving articles into separate groups will now be described, by way of example, with reference to the diagrammatic drawings accompanying the Provisional Specification, in which:

Figure 1 is a side elevation of the system;

Figure 2A to 2E are fragmentary views of the system of Figure 1 indicating successive operative positions in a complete operating cycle of the system;

Figure 3 is a fragmentary plan view of the system of Figure 1; and

Figure 4 is a side elevation of a retractable conveyor of the system.

The conveyor system shown in Figures 1 to 3 is arranged to receive pairs of meat slices or pairs of batches of meat slices, in which the pairs are serially arranged with predetermined spacing between them and the slices or batches of each pair are spaced transversely of the conveyor sustem. The serially arriving pairs of meat slices or batches are grouped by the system into groups of two and the groups are fed to a packaging station where the four slices or batches of each group are packaged simultaneously.

As shown in Figure 1, the system includes an infeed conveyor 10 in the form of an endless conveyor belt 11 mounted on a pair of spaced rollers 30 and 32. The belt has transversely extending spacer pips 12 which enable operatives as shown to place meat slices or batches on the conveyor belt 11 at appropriately spaced intervals and in pairs as described, the meat slices being fed to the operatives by a supply conveyor 14. The downstream roller 32 is coupled by a drive belt 34 (see Fig. 3) to a drive motor (not shown). Another endless belt 16 in the form of multiple strands is superimposed upon the upper and lower runs of the belt 11 and has its downstream end supported by roller elements 42 which are spaced downstream of the downstream roller 32. The belt 16 thus allows the spacer pips 12 to project between adjacent strands but acts to reduce the possibility of stray particles becoming lodged between the two belts 11 and 16 by virtue of the close contact that the belts make with each other.

The meat slices or batches reaching the

downstream end of the conveyor 10 thus continue to be fed by an endless belt 16 to a retractable conveyor 18, which will be described in more detail hereinafter but briefly its length can be varied between a retracted and an extended position. The retractable conveyor 18 (see Figs. 3 and 4) has a multistranded endless belt 36 which at its upstream end extends partially around a roller 40 rigid with a shaft 38. The endless belt 16 is supported by the roller 32 and a roller 42 also rigid with the retractable conveyor shaft 38. In this way the drive transmitted to the roller 32 is also transmitted by the belt 16 to the shaft 38 and therefore to the endless belt 36. The retractable conveyor 18 feeds meat slices or batches reaching its downstream end to a transfer conveyor 20. The transfer conveyor 20 has a multistranded endless belt 44 (Fig. 3) supported at opposite ends by shafts 46 and 48. The upstream shaft 46 carries a pulley 50. A drive belt 52 links the pulley 50 with another pulley 54 mounted on the shaft 38 through a clutch 56. The transfer conveyor 20 in turn feeds the meat slices or batches to a packaging machine 22. A pulley 60 mounted on the shaft 46 by a one-way clutch 58 is coupled by a drive belt 62 to the packaging machine 22. Upon receiving each group of meat slices or batches the packaging machine feeds them intermittently to a packaging station where the meat slices or batches in the group are simultaneously packaged, the packaging machine is advantageously of the type described in the cognate complete specification filed in pursuance of our cognate copending British Patent Application Nos. 44298/74 and 1430/75 (Serial No. 1523122).

A sensor 24 located at the downstream end of the transfer conveyor is arranged to detect the arrival of the group at the downstream end and in response thereto activates the packaging machine 22.

In more detail, a complete cycle of the system will now be described with reference to Figures 2A to 2G. It will be assumed that the retractable conveyor 18 is in its retracted state, that is in a state of minimum operative length, and that the transfer conveyor 20 carries a group of four meat slices or batches.

This situation is shown in Figure 2A. The conveyor belts of the transfer conveyor 20, the retractable conveyor 18, and the belt 16 are all being driven at the same speed, the clutch 56 being engaged to allow the drive from the drive motor (not shown) to be transmitted to the transfer conveyor.

As the group on the transfer conveyor reaches the sensor 24, the sensor will respond to detection of the group by decoupling the clutch 56. The movement of the group on the transfer conveyor is immediately halted. With the transfer conveyor stationary the groups still continue to be fed by the retractable conveyor 18 and the infeed conveyor 10. Accordingly, the retractable conveyor 18 is progressively extended in a manner to be described hereinafter so that its upper run lies above the upper run of the transfer conveyor. This allows the slices or batches on the retractable conveyor to continue moving without being transferred to the transfer conveyor. During this period the packaging machine which has been activated by the sensor indexes the group it carries towards the packaging station 22 and this movement of the packaging machine is transmitted through the one-way clutch 58 to the transfer conveyor 20 which thereupon simultaneously transfers the group that it carries to the packaging machine. Once the group on the transfer station has passed the sensor 24 (see Figure 2B), the clutch 56 is re-engaged and the belt of the transfer station is again driven in synchronism with the belt of the retractable conveyor 18. The sensor 24 at this time also actuates a tilting mechanism, to be described in more detail hereinafter, of the retractable conveyor 18 to cause the downstream end of the retractable conveyor 18 to drop to the level of the upper run of the transfer conveyor 20 (see Figure 2C) thus facilitating the transfer of the leading group on the retractable conveyor 18 to the transfer conveyor 20. Immediately after the tilting operation, the retractable conveyor 18 is retracted (see Figure 2D) thereby speeding up the transfer of the group from the retractable conveyor 18 to the transfer conveyor 20. At the end of the retraction, when the group is free of the retractable conveyor the tilting mechanism acts to raise the downstream end of the retractable conveyor 18 to its former level (see Figure 2E) and the group continues on its way towards the sensor 24 on the transfer conveyor. When the group reaches the sensor the whole cycle of events is repeated.

Advantageously the packaging machine is arranged to pack forty pairs of meat slices or batches per minute and consequently the system cycle has a duration of 3 seconds. The cycle preferably progresses at such a rate that the situation reached in Figure 2B occurs one second after the start of the cycle, the situation illustrated in Fig. 2C occurs 1¼ seconds after the start of the cycle, the situation reached in Figure 2D occurs 2¾ seconds after the start of the cycle and the situation illustrated in Figure 2E occurs 3 seconds after the start of the cycle.

It will be appreciated that the packaging

machine operates upon a self-imposed cycle which is independent of the cycle of the conveyor handling system except for the initiation provided by the sensor 24. However, the cycles of the packaging machine and the conveyor handling system must coincide in particular at the time of transfer of a group from the transfer conveyor to the packaging machine and for this reason there is advantageously a short dead period between the end of the packaging machine cycle and the instant that the sensor senses the arrival of a group to accommodate short delays of timing inaccuracies between the two cycles. During this dead period the retractable conveyor extends to provide a holding reservoir for the following group. To achieve the dead period, the packaging machine cycle is made slightly shorter than the conveyor handling system cycle. The packaging machine is accordingly halted after each of its cycles and only started again in response to the sensor 24.

The retractable conveyor system will now be described in more detail with reference to Figure 4.

As shown in Figure 4 the system has a fixed roller 40, two further rollers 80 and 82 mounted on a movable carriage 84 and a roller 76 which is supported by a spring 77 which allows a very limited movement of the roller 76 to ensure the belt is tensioned. The endless belt of the system is trained around the four rollers 40, 80, 82 and 76. The upper run of the belt which is defined between the rollers 80 and 40 can be extended or retracted by moving the carriage 84 with the additional or surplus amount of belt being supplied or taken up by the amount of belt required to link the rollers 82 and 76 with the rollers 80 and 40. The rollers 82 has a shaft 81 which carries a pair of Nylon (RTM) guide shoes 86, which run on rails 88. The carriage is thus slidable parallel to the rails 88. The downstream end of the carriage 84 is supported by the tilting arrangement. The tilting arrangement includes an arm 85 carrying a guide roller 87 at its distal end. The guide roller 87 in turn engages a horizontally extending slot in a guide 89. The guide 89 is supported for vertical movement by a pneumatic piston and cylinder arrangement 90. In this way the downstream end of the conveyor can be lowered and raised irrespective of the position of the carriage 84 along the guide rails 88. The carriage is reciprocated by means of a pneumatic piston and cylinder arrangement 92 the piston 96 of which carries an arm 94 having a forked end portion which engages the shaft 81. The carriage 84 can thus be reciprocated irrespective of the angle of tilt.

A control system (not shown) controls the piston and cylinder arrangement 90 and 92 in a predetermined sequence. The sequence is as follows. With the carriage at its extreme right hand end position (as viewed in Figure 4) the arrangement 92 is actuated to drive the carriage to the left hand side at a speed at least equal to that of the belt 36. When the carriage reaches the end of its forward stroke, the arrangement 90 is actuated and the left hand ends of the conveyor are lowered until the upper run reaches the level of the upper run of the transfer conveyor. At the same time the arrangement 92 causes the carriage to perform its return stroke.

At the completion of the return stroke, the arrangement 90 raises the left hand end of the conveyor to its former level in readiness for another cycle.

It will be appreciated that instead of grouping and feeding meat slices or batches to a packaging machine, the conveyor handling system can be used to group regularly arriving articles for other purposes.

While each conveyor belt is shown in the form of a plurality of strands (see Figure 3), of plastics it can comprise a single continuous endless web.

WHAT WE CLAIM IS: —

1. A conveyor handling system for batching regularly arriving article or article collations into groups and intermittently discharging the groups, comprising an infeed conveyor for carrying regularly spaced articles or collations, a retractable conveyor for receiving the regularly spaced articles or collations from the infeed conveyor and discharging them onto an intermittently drivable transfer conveyor, and a control system operable to extend the downstream end of the retractable conveyor at a speed at least equal to the surface speed of the retractable conveyor, to allow the transfer conveyor to be independently driven to discharge articles therefrom, thereafter causing the transfer conveyor to be driven at the same speed as the surface speed of the retractable conveyor while retracting the downstream end of the retractable conveyor to cause the transfer of articles from the retractable conveyor to the transfer conveyor.

2. A system according to claim 1, wherein the retractable conveyor is arranged to extend by extending its upper run in a horizontal plane located vertically above the plane of the upper run of the transfer conveyor.

3. A system according to claim 2, including tilting means operative during the retracting of the upper run of the retractable conveyor to lower the downstream end of the upper run of the retractable con-

veyor to the level of the upper run of the transfer conveyor.

4. A system according to any preceding claim, including sensing means operative to halt the movement of the transfer conveyor when articles thereon reach a predetermined position.

5. A conveyor handling system substantially as hereinbefore described with reference to the drawings accompanying the provisional specification.

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4 SHEETS

PROVISIONAL SPECIFICATION

This drawing is a reproduction of the Original on a reduced scale

Sheet 1

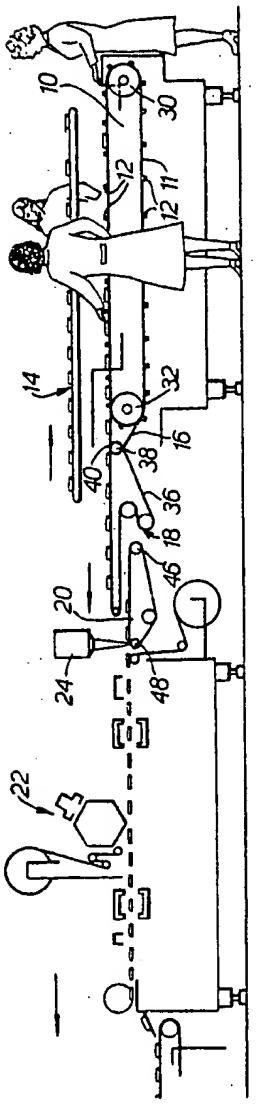

FIG. 1.

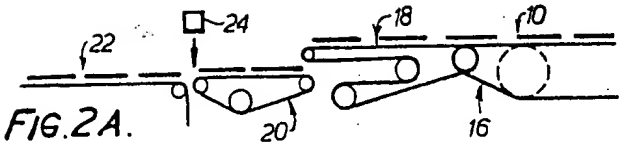

FIG. 2A.

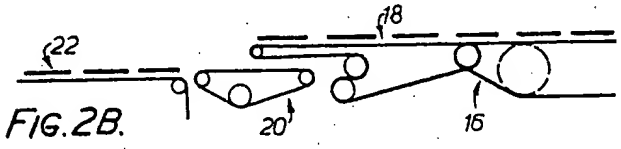

FIG. 2B.

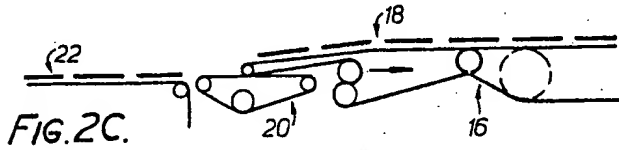

FIG. 2C.

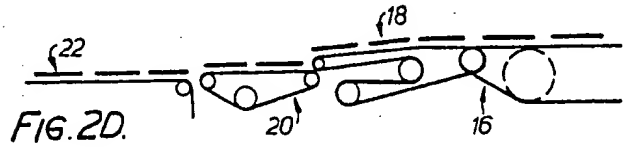

FIG. 2D.

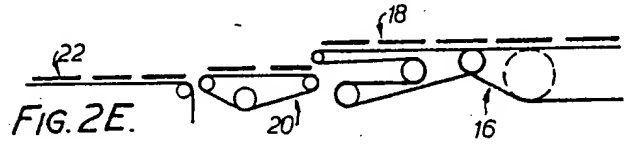

FIG. 2E.

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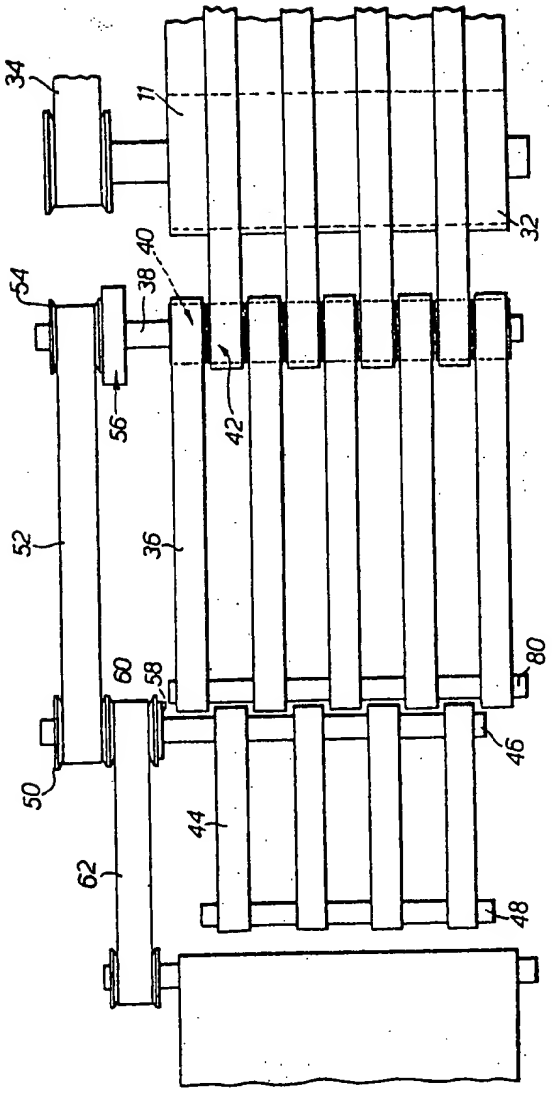

FIG. 3.

1576718 PROVISIONAL SPECIFICATION
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Sheet 4

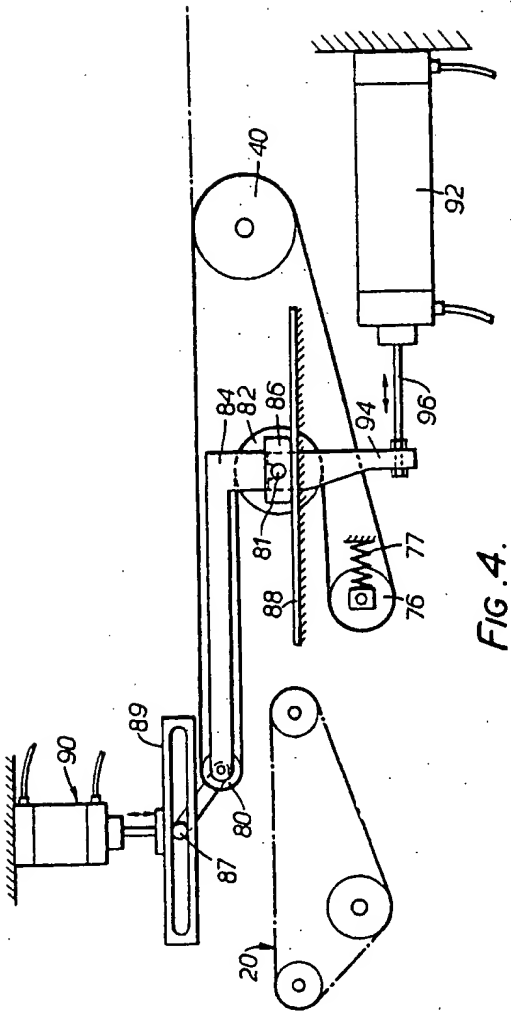

FIG. 4.